Proton interactions with nuclei to probe the neutron matter distribution of the nucleus.

Ken Amos, Steven Karataglidis

University of Melbourne, Australia

Analyses of intermediate energy nucleon-nucleus scattering made using coordinate space nonlocal optical potentials obtained by full folding medium modified effective NN interactions are sensitive to the target nucleon densities used in that folding. As the effective interaction and the structure details are all preset and no a posteriori adjustment or simplifying approximation is made to the folded optical potentials, the observables obtained are predictions. The procedure, under inverse kinematics, is able to explain observed data from radioactive beam experiments in which exotic, halo nuclei, are scattered from Hydrogen targets. However, when one has proton, neutron, and electron scattering form factors to assess putative ground state structures, those model structures of the target are particularly well tested. Results probing the ground state structure of ^{208}Pb in particular, reveal that the comparisons to measured data suggest most strongly that the neutron r.m.s. radius is 5.62 fm, and the neutron skin thickness is 0.17 fm. Predictions of integral observables as well as of angular distributions made using those optical potentials compare very well with observed data for energies in the range above noticeable excitation of giant resonances to 300 MeV. The latest results for stable as well as some exotic neutron/proton rich nuclei will be shown.

Email: amos@physics.unimelb.edu.au